

Lesson no. 12 Black seeds (kalonji) (Black caraway).



Black seeds are called as black caraway, black cumin, Nigella in English; in Latin it is called as *Nigella sativa*; its botanical family Ranunculaceae; in Urdu & Hindi it is called as kalonji. It has been used as natural herb since long & well known for its medicinal properties & health benefits. In Hadith it is called as Habbatus-sauda & Shuneiz. It is mentioned in Hadith of Ibn-Majah, Tirmizi that it is cure for all diseases except death. Please refer lesson no. 45 page no. 111 in my part-2 book.

- **NAMES:-**

1. It is called as Small Black seed, Samal fennel and Black Cumin, Black Caraway in English
(الحبة السوداء) (الشونيز)
2. In Hadees it is called as Habbat Sauda'a & Shuneiz.
(الحبة السوداء) (الشونيز)
3. In Arabic it is called as Habbat Sauda'a
(الحبة السوداء)
4. In Sanskrit it is called as Krishna jeerak.
5. In Latin it is called as *Nigella sativa*.
6. In Urdu & Hindi it is called as Kalonji.
7. In Persian it is called as Shuneiz.
(الشونيز)

Please visit my website www.tib-e.nabi-for-you.com for detail Islamic study on it.

It is mentioned in following books of Hadith (reference are also given as Hadith number) Ibn Majah : 3573, 3574, 3575; Tirmizi: 2176, 2212.

- **Black seed plant: -**



It is an annual plant grown for its pungent seeds; its plant is found in south-western Asia, Africa, Middle East, Europe etc. it grows from 20 to 60 cm (8 to 24 inches) in height; the plant has a developed tap root. It can grow in variety of soils & readily reseed, becoming weedy in some area. It is erect, much branched, annual plant with a well-developed tap root.

- **Leaves: -**

Its leaves are deeply divided, linear shaped (but not thread like); the upper leaves & petiolate are long, white, the lower leaves are small having flowers.

- **Flower:** -



Flowers are pale blue or white coloured; it has 5 petals, numerous stamens; 5 to 6 elongated fused carpels. Flowers are delicate; flowers are also used as a natural remedy for treating ailments.

- **Fruit:** -



It is a large & inflated capsule composed of 3 to 7 united follicles, each contain seeds in it.

- **Seeds:** -



Seeds are black coloured, triangular or pyramidal shaped, are borne in a capsule with 5 to 6 segments, each of which terminate in an elongated projection. Seeds have pungent bitter taste & smell; it is used mostly after roasting; oil is extracted out from it which is beneficial for health & treating diseases. The seeds are of white colour & rupture for the fruit capsule, once matured, usually turn black once exposed to air; seeds & its oil contain more than 100 types of chemical compounds & amino acids, vitamins, minerals & essential fats.

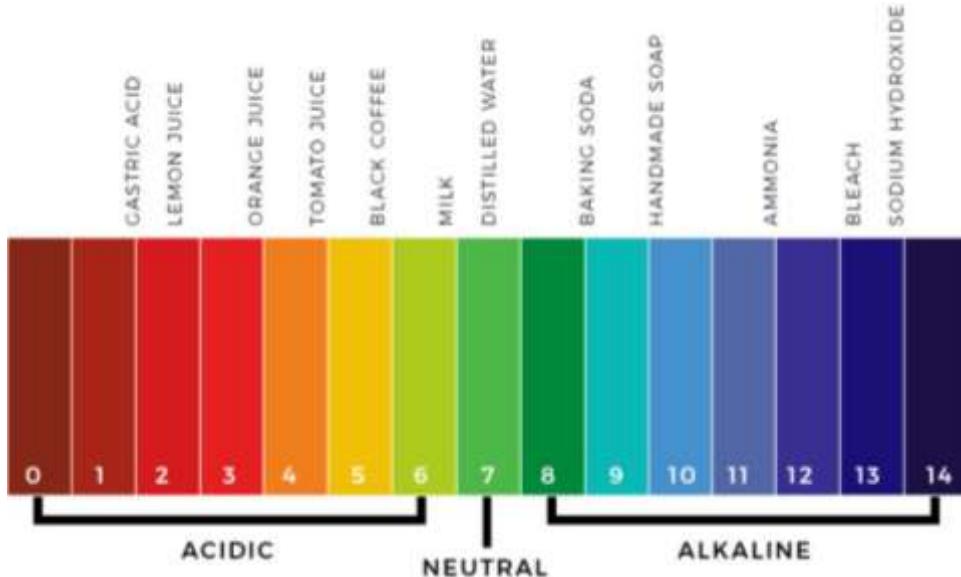
- **pH of black caraway is:** - pH of its seed is 5.0 to 8.2 & oil is 7.4; it is slightly acidic or alkaline because its pH is around 7.

pH is a measure of hydrogen ion concentration, a measure of the acidity or alkalinity of a solution. The pH scale usually ranges from 0 to 14. Aqueous solutions at 25°C with a pH less than 7 are acidic, while those with a pH greater than 7 are basic or alkaline & 7 is neutral; only aqueous solutions have pH levels, vegetable oil has no pH value. Likewise, other oils such as animal and petrochemical oils also have no pH value. Fatty acids are organic molecules often found in foods, including vegetable oils.

The pH of pure water is 7. In general, water with a pH lower than 7 is considered acidic, and with a pH greater than 7 is considered alkaline. The normal range for pH in surface water systems is 6.5 to

8.5, and the pH range for groundwater systems is between 6 and 8.5. We can add normal water to reduce the acidity.

It is Sunnat of Prophet Muhammed (s.a.w) to mix acidic with Alkaline to make it neutral or less acidic that why He used to eat dates with watermelon or cucumber or dry dates with little butter; so you can mix one acidic with alkaline; also it is Sunnat to drink honey mixed in water; also dates or raisins soaked in water over night & drink the syrup (sharbat). Remember do not soak dates & raisins together at one time; soak at separate time & drink.



- **Calories:** -

100 gram seed gives 345 calories & 100ml oil gives 900 calories (9 calories in each ml).

- **Glycemic index & Glycemic load of it:** - it has very low glycemic index & load both.

A food is considered to have a low Glycemic index (GI) if it is 55 or less; mid-range GI if 56 to 69 & high GI if 70 or more. Glycemic index is a number. It gives you an idea about how fast your body converts the carbs in a food into glucose.

A low Glycemic load (GL) is between 1 and 10; a moderate GL is 11 to 19; and a high GL is 20 or higher. For those with diabetes, you want your diet to have GL values as low as possible.

The glycemic load (GL) of food is a number that estimates how much the food will raise a person's blood glucose level after eating it. Glycemic load accounts for how much carbohydrate is in the food and how much each gram of carbohydrate in the food raises blood glucose levels.

- **Gross benefits of Black seed oil:** -

It is extracted from black seeds; always use pure virgin black seed oil; it is edible & can be used in cooking, massage, drank raw, instill in nose & ear, apply on hair, wound, burns, psoriasis, eczema, acne, dermatitis, can be mixed with other herbal oils or herbs; its oil is used orally for asthma, diabetes, migraine, blood pressure, arthritis, rheumatoid arthritis, inflammation, infecting, digestive disorders, weak immunity etc.

- **Gross benefits of black seeds:** -

It is anti inflammatory, antioxidant, anti parasitic, anti infective, anti microbial, anti hypertensive, anti cancer, anti flatulence, anti allergic, anti ulcer, anti diabetic, anti helmentic, anti arthritis; it is thermogenic, carminative, analgesic, helpful in all skin & hair problems like psoriasis, eczema, acne, black spots, pimples, burns, rashes, dry skin, wrinkles, also helpful in menstrual problems.

Seeds can be crushed in extra virgin olive & mix it well & apply on skin, burns, wounds, hair, instill in nose. 7 seeds can be crushed & mix in some honey & lick on empty stomach early morning.

- **Clinical pharmacology of black caraway: -**

Hay fever (allergic rhinitis): Early research suggests that taking a specific product containing black seed oil, vitamin E, beta-carotene, and biotin (Immerfit by Phyt-Immun) by mouth daily might improve allergy symptoms in people with hay fever.

Itchy and inflamed skin (eczema): Early research suggests that taking a specific product containing black seed oil, vitamin E, beta-carotene, and biotin (Immerfit by Phyt-Immun) by mouth daily might improve symptoms in people with itchy and inflamed skin. However, applying 15% black seed oil ointment to the skin for 4 weeks does not appear to improve itching or disease severity in similar patients.

Seizures (epilepsy): Early research suggests that taking black seed extract by mouth every eight hours for 4 weeks might reduce the number of seizures in children with epilepsy.

High cholesterol: Evidence regarding the effectiveness of black seed for high cholesterol is conflicting. Some early research suggests that taking whole crushed black seed 1 gram twice daily before meals for 4 weeks reduces cholesterol, "bad" low-density lipoprotein (LDL) cholesterol, and blood fats called triglycerides in people with high cholesterol. However, other research shows that taking powdered black seed 1 gram twice daily for 6 weeks does not improve cholesterol.

High blood pressure: Early research suggests that taking black seed extract twice daily for 8 weeks might slightly improve blood pressure in some people.

Metabolic syndrome: Early research suggests that taking a specific black seed oil product twice daily for 6 weeks might reduce total cholesterol, "bad" low-density lipoprotein (LDL) cholesterol, and blood sugar levels in people with metabolic syndrome.

Relieving symptoms: related to narcotic drug withdrawal (opiate withdrawal). Early research suggests that taking black seed extract by mouth three times daily for 12 days might reduce symptoms of opiate withdrawal.

Sore throat and swollen tonsils: (tonsillopharyngitis). Early research suggests that taking a combination of chanca piedra and black seed by mouth for 7 days relieves pain in people with sore throat and swollen tonsils. There a lot of more benefits of it please read in separately mentioned below in content section.

- **Modern uses:-**

For general health & fitness: -

Crush 7 seeds of black caraway & mix in little extra virgin olive oil & apply in both nostril for 3 days daily than once a month 3 days cycle; 1st day 3 drops in right nostril & 2 drops in left; 2nd days 2 drops in right & 3 in left; 3rd day 3 drops in right & 2 drops in left.

For diabetes, blood pressure: -

Crush 7 seeds of black caraway & mix in 1 spoon of extra virgin olive oil and lick it early morning empty stomach also eat 5 pieces of watermelon daily for 5 days a week.

In my book there are 112 formulations mentioned of black caraway (black seed) to be used in different diseases. Lesson no. 45 page no. 111.

Liver diseases Jaundice:

1. JAUNDICE: - Take one cup of milk, add half tea spoon of Black Caraway (kalonji) oil and use this mixture twice a day, morning and after dinner). Treatment may continue for a week. Avoid fatty and sour eatable items.
2. LIVER DISORDER AND JAUNDICE: - Put some carom seeds (Ajwain) in water and next day filter and pour 3 spoon of Black Caraway (Kalonji) oil in carom water. Take once a day. Or take some leaves of Heena (Mehandi) and put in the water at night time. In the morning after filtering add 14 pieces of Black Caraway (Kalonji) seeds, one spoon of honey and 1 spoon of Black Caraway (Kalonji) oil. Use this mixture once in a day.

3. 3. DISEASES OF LIVER & ABDOMENT: - Take 100 grams of honey and half tea spoon of Black Caraway (Kalonji) oil and drink this mixture half in the morning before breakfast and half in the evening. Use this process for one month. Avoid Tamarind items.

Abdominal Pain:

4. STOMACH PAIN: - Mix 1 spoon of Black Caraway (Kalonji) oil with pinch of salt in half glass of warm water and drink it. It is useful for stomach pain.
5. STOMACH PAIN: - (all types): In a glass of sweet lime (Mosambi) juice add to spoon of honey and half tea spoon of Black Caraway (Kalonji) oil and use this mixture twice a day. Avoid all gas elements. Treatment may continue for 21 day.
6. STOMACH PAIN: - Mix 1 spoon of Black Caraway (Kalonji) oil with pinch of salt in half glass of warm water and drink it. It is useful for stomach pain.
7. STOMACH ACHE OF THE CHILDRENS: Take two drops of Black Caraway (Kalonji) oil mix it with mother's milk or cow milk and give to the child. Black Caraway (Kalonji) oil also should be rubbed on the ribs.

Abdominal Swelling:

8. SWELLING OF STOMACH: - Mix 3 grams of powdered caron seeds (Ajwain), 3 grams powdered Fenugreek seeds (Methi) & 4 drops of Black Caraway (Kalonji) oil together. Take this mixture before breakfast and before dinner.

Abdominal Abnormalities

8. DISEASES OF ABDOMEN: - (Hernia): - Take one tablespoon of juice of Bitter Gourd (Karela) and add half tea spoon of Black Caraway (Kalonji) oil. Use this mixture in the morning before breakfast and before lunch and before dinner.
9. GASES AND ACIDITY: - Mix some ginger juice with 10 drops of Black Caraway (Kalonji) oil, add some salt and water. Use mixture for immediate relief.
10. DYSEPIPSA, INDIGESTION, GASES, STOMACH IRRITATION AND STOMACH ACHE: - In this case take one spoon of Ginger juice and half tea spoon of Black Caraway (kalonji) oil and drink twice a day. This treatment is also useful for removing obesity. This medicine makes the patient slim.
11. DYSENTERY, DIARRHEA: - Mix some isapgol with half cup of curd and 1 tea spoon of Black Caraway (Kalonji) oil, use three to four times a day
12. GASTICE TROUBLES: - Take 60 grams powdered carom seeds (Ajwain), 1 spoon Black Caraway (Kalonji) oil and mix 3 teaspoon lime juice let it dry in the Sun add 10 grams of black salt and use daily once in evening.
13. CONSTIPATION: - 20 gms of jaggery (gudh), 4 grams senna powder (sona mukhi) (cassia agustifolia) mixed with a glass of warm water add 1 spoon Black Caraway (Kalonji) oil and drink it before going to bed.
14. DIGESTION OF FOOD: - Treatment: Mix 2 drop of ginger, half spoon of Black Caraway (Kalonji) oil and one spoon of sugar. Use this mixture twice a day (Morning and evening). Continue the treatment for 10 days. Avoid gas creating food.
15. MEDICINE FOR DIGESTION: - Mix 40 grams powder of carom seeds (Ajwain), 1 spoon Black Caraway (Kalonji) oil with lime juice let it dry in the sun use one pinch after every meal. Avoid gas creating foods.
16. NAUSEA AND VOMITING: - Mix and preserve, 100 grams pure vinegar (sirka) 200 grams sugar and 3 spoon of Black Caraway (Kalonji) oil. Use 10 to 20 ml 2 times a day or as per need.
17. NAUSEA OR VOMITING: - Take one spoon of Caration powder and add half tea spoon Black Caraway (kalonji) oil and boil it. Now in this warm mixture add mint (Pudina leaves) & use thrice a day.

Worm infestation:

18. WORMS IN THE STOMACH: - Mix one spoon vinegar with half tea spoon of Black Caraway (Kalonji) oil. Take thrice a day morning before the breakfast, after noon and at night. Continue the treatment for 11 days.
19. ROUND WORMS AND TAPS WORMS IN THE STOMACH: - Take half spoon Vinegar mixed with half tea spoon of Black Caraway (Kalonji) oil and use it twice a day and eat some coconut pieces. Avoid sugar items.
20. WORMS IN THE STOMACH: - Take 14 crushed seeds of Black Caraway (Kalonji); 2 drop of Black Caraway (Kalonji) oil and one drop of pure vinegar (sirka) mix it in 250 ml of water & drink it.
21. FOR HICCUPS: - Eat 1 spoon Black Caraway (Kalonji) oil and 7 seeds of Black Caraway (Kalonji) with butter.
22. HICCUPS: - Take one big spoon cream (Malai) Mixed with 2 drops of Black Caraway (Kalonji) oil and drink in the morning and in the night. Treatment may continue for seven days.
23. JOINT- PAINS AND ARTHRITIS, etc.: - Take one spoon of vinegar, add half tea spoon of Black Caraway (Kalonji) oil and mix two spoons honey, use twice a day (In the morning before the breakfast and in the night after dinner)
24. JOINT PAIN: - Swelling on ankle and other pains in the joints. Take one spoon vinegar and two spoons of honey and add half tea spoon of Black Caraway (kalonji) oil. Use this mixture two times a day and also massage with same oil or (Til) oil. Avoid gas producing elements for 21 days.

- **Contents/constituents of Black seed oil: -**

All contents may not present in all types of it, because there are many varieties of it according to geographical regions & content may differ a lot as per cultivation, soil, seed, climate etc.

It contains many compounds like benzenediol, pyrazine, limonene, p-cymene, campesterol, stigmasterol, beta sitosterol, carvone, linolenic acid, stearic acid, cuminaldehyde, nigello, spinasterol, palmitoleic acid, citronellol, citronelly acetate, arachidic acid, anethole, oleic acid, thymol, myristic acid, thymoquinone, calcium, iron, sodium, potassium, zinc, selenium, magnesium and vitamin B1, B2, B3 and B6, caryophyllene.

- **Contents of black seeds: -**

Selenium, iron, magnesium, folate, copper, calcium zinc, lutein & zeaxanthin, carotene, potassium, Vitamin A, E, B1, B2, B3, B5, B6, carbohydrate, manganese, alkaloid, saponin, fiber, tannin, limonene, linoleic acid, oleic acid, beta sitosterol, phytosterol, stigmasterol, thymoquinone, carvacrol, lipases, nigellin, nigellone, phosphorus, essential fatty acids, amino acids, pinene, terpinene.

The main component in the essential oil of *nigella sativa* is thymoquinone. It contains up to 50% of this phytochemical compound, which has antioxidant properties. It also contains about 40% p-cymene and 15% a-pinene; naturally occurring organic compounds, as well as small amounts of other constituents.

Active ingredient of black caraway: - main are thymoquinone, nigellin; & other common are p-cymene, carvacrol, α-thujene, thymol, t-anethole, β-pinene, α-pinene, and terpinene.

Total amino acids in black caraway seeds of different region: -

Acids	RRT	Egyptian	Iranian	Turkish	Syrian	MeanA	C.V.%
Essential amino acids							
Threonine	0.547	0.34	0.23	0.13	2.06	0.69 ± 0.46	132.95
Methionine	1.533	1.14	1.17	1.61	0.80	1.18 ± 0.17	28.15
Isoleucine	1.626	1.92	2.27	2.32	2.15	2.17 ± 0.09	8.23
Leucine	1.672	3.37	4.09	4.18	3.77	3.85 ± 0.18	9.52
Phenylalanine	1.857	2.46	2.99	2.78	2.63	2.72 ± 0.11	8.29
Histidine	2.197	2.42	3.07	2.89	2.19	2.64 ± 0.20	15.42
Lysine	2.345	2.33	2.92	2.68	2.02	2.49 ± 0.20	15.87
Arginine	2.724	5.62	6.40	6.35	4.94	5.83 ± 0.35	11.85
Non-essential amino acids							
Aspartic	0.441	4.73	5.29	5.44	4.45	4.98 ± 0.23	9.36
Serine	0.596	1.78	1.55	1.52	2.20	1.76 ± 0.16	17.81
Glutamic	0.653	12.98	1.48	---	11.19	6.41 ± 3.31	103.21
Glycine	0.997	1.98	2.21	2.31	1.88	2.10 ± 0.10	9.50
Proline	1.000	46.07	51.56	53.70	47.40	49.68 ± 1.78	7.16
Alanine	1.031	2.75	3.35	3.20	2.72	3.01 ± 0.16	10.58
Cystine	1.268	7.23	8.21	8.09	6.66	7.55 ± 0.37	9.74
Tyrosine	1.792	2.88	3.21	2.80	2.94	2.96 ± 0.09	6.01
Total essential amino acids	19.60	23.14	22.94	20.56	21.56 ± 0.88	8.14	
Total non-essential amino acids	80.40	76.86	77.06	79.44	78.44 ± 0.88	2.34	
Total amino acids	100.00	100.00	100.00	100.00			

The above ingredients are based on scientific study, means these has been indentified, known & learnt by modern science, it does not means that it contains only these ingredients, there may be many more ingredients which are yet to be discovered, learnt & known by modern science.

- **Basic pharmacology of contents of black caraway seeds & its oil, that are naturally present & not synthetic: -**
- **Thymoquinone: -**

It is an active ingredient of black caraway; It is a phyto-chemical; it is mostly found in black caraway seeds; it is an emerging natural drug with a wide range of health benefits; it is a volatile oil.

Main sources of thymoquinone: -

Monardo fistula (bee balm-a wild flower), tetraclinis, genera cupressus, black caraway seed, juni perus.

Basic pharmacokinetics of thymoquinone (based on human intake in natural food products): -

Its absorption, metabolism & excretion are yet not known & are under research.

Basic clinical pharmacology of thymoquinone: -

It is anti inflammatory, antioxidant, anti diabetic, anti hypertensive, anti cancer, hepato-protective, helpful in cough, asthma, bronchitis, eczema, fever, dizziness, influenza, renal diseases, protects kidneys, improves insulin secretion.

- **Pinene**

It is a bicyclic monoterpene chemical compound. There are two structural isomers of pinene found in nature: α-pinene and β-pinene. As the name suggests, both forms are important constituents of pine resin; they are also found in the resins of many other conifers, pine tree, maktur tree oil, lime fruit peel, as well as in non-coniferous plants such as camphorweed (*Heterotheca*) and big sagebrush (*Artemisia tridentata*). It is anti-inflammatory, bronchodilator, antianxiety, anti-pain etc.

- **Terpinene: -**

Terpinene are group of isomeric hydrocarbons & classified as monoterpenes; Alfa terpinene is isolated from cardamom & marjoram oil & from other natural sources, but beta terpinene is made artificially (compounding). Natural sources of it are cuminum cyminum, melaleuca alternifolia, cannabis, apples, tea, cumin, nutmeg, rosemary etc. It has a pleasant aroma & flavour; it is used in manufacturing soaps, perfumes, lotions, insect repellent; it reduces anxiety because it is sedative, it is anticancer, antioxidant.

- **Limonene: -**

It is a chemical found in the peel of citrus fruits & other plants; it is used to make medicinal ointments, creams, to facilitate penetrate the skin, & also used in beverages, chewing gums, ready food & used as a flavouring agent.

Main sources of limonene: -

Citrus fruit & its peels, grapes, black caraway seeds, soda drink, citrus peel oil.

Basic pharmacokinetics of limonene (based on human intake in natural food products): -

It is completely absorbed in intestines & there is rapid excretion in urine & little in stools; very less is known about its absorption & metabolism.

Basic clinical pharmacology of limonene: -

It prevent cancers, weight gain, helpful in bronchitis, boost immunity; it is antioxidant, anti inflammatory, anti tumour, improves gall bladder health, cleans out the sludge in gall bladder; good for skin, boost metabolism, reduces stress, anxiety.

• **Thujene: -**

It is referred as alpha-thujene; it is a monoterpenoid found in many essential oils of plants; it is similar to sabinene; it is present in marjoram oil, boswellia serrata oil, eucalyptus oil, it has a pungent taste, green herbal woody smell, it is yellowish transparent; it is anti inflammatory, anti-arthritis, antimicrobial, insecticide.

• **Lipases: -**

In plants lipases is present in food reserve tissues of growing seedlings, especially in those which contain large amount of triacylglycerols. It is an enzyme; lipases present in black seeds are called as black cumin lipases; it catalyzes the hydrolysis of lipids (fats).

Main sources of lipases: -

Corn, wheat, rice, seed oil ,cereal seed oil, coconut oil, almond oil, banana, avocados, ginger etc.

Basic pharmacokinetics of lipases (based on human intake in natural food products): -

Its absorption, metabolism & excretion are yet not known & are under research.

Basic clinical pharmacology of lipases: -

It is helpful in digestion, transport & process dietary lipids, celiac diseases, cystic fibrosis, IBS, gall bladder disease, reduces cholesterol, controls heart disease, weight, increases nutrition absorption.

• **Nigellin: -**

It is an active ingredient of black seeds; it is helpful in asthma, inflammation, it is anti diabetic, anti cancer, anti obesity, its absorption & metabolism is not known.

• **Carvacrol: -**

It is a mono-terpenoid phenol; it has a pungent, warm odour of oregano, it is also called as cymophenol.

It is present in thyme oil, oregano, pepperwort, wild bergamot. It helps in curing candida infection & yeast infections; it is anti cancer, anti bacterial, antioxidant, anti-inflammatory, reduces blood pressure, improves gut health; heals wounds etc. it is an active principle of oregano oil. Its absorption, metabolism in human is yet not known.

• **Nigellone: -**

It has anti spasmotic effects on trachea & acts on respiratory clearance. Its absorption, metabolism is not known.

• **Carvone: -**

It gives black seeds a special taste & odour; it is a volatile terpenoid. Its absorption, metabolism is not known.

Main sources of carvone: -

Black seed, dill seed, orange peel oil, spearmint, mandarin.

Basic clinical pharmacology of carvone: -

It is a decongestant, diuretic, anti viral, anti tumour, carminative, cardio-protective, stomachic, prevents bronchitis, asthma, cough, laryngitis, sore throat, colicky pain, urinary infection, reduces and relief gastric spasm.

- **Campesterol: -**

It is a phytosterol whose chemical structure is similar to cholesterol, it is phyto-steriod in nature; it reduces cholesterol (reduces absorption of cholesterol in intestine), prevents cancer.

Main sources of campesterol: -

Soybean oil, vegetable oil, banana, cucumber, grapes seed oil, onion, potato, lemon grass etc.

- **Stigmasterol: -**

It is among unsaturated phytosterol; it maintains the structure & physiology of cell membrane; it reduces LDL & cholesterol, reduces risk of heart diseases, it prevents atherosclerosis.

Main sources of stigmasterol: -

Soybean, calabar bean, rape seed, legumes, nuts, milk, seeds, grape seed oil etc.

- **Spinasterol: -**

It is among phytosterol found in a variety of plants like spinach (that why called as spinasterol), cucumber, gordonia, cylanica, argan oil, pumpkin seeds, senega root, alfalfa meal. Its absorption, metabolism is not known.

Basic clinical pharmacology of spinasterol: -

It modulates mitochondrial activity & gene expression of nuclear receptor; it is anti tumour, antioxidant, anti inflammatory, good for complexion.

- **Citronellol: -**

It is a natural terpenoid; it has special rose like smell; it is a constituent of essential oils like rose oil, geranium, neroli, chamomile, basil, lemon grass & lavender oil. Its absorption & metabolism is not known.

Basic clinical pharmacology of citronellol: -

It is anti fungal, anti microbial, anti cancer, anti inflammatory, reduces blood pressure, analgesic, good for cardio vascular diseases, anti spasmodic, nourishes hair, increases digestion, good for complexion, boost immunity.

- **Thymol: -**

It is a natural mono-terpenoid phenol mostly present in thyme plant; it has pleasant aromatic odour, it is anti hook worm.

Main sources of thymol: -

Thyme oil, eye bright plant (Euphrasia rostkoviana), monarda didyma & origanum compactum.

Basic pharmacokinetics of thymol (based on human intake in natural food products): -

It is readily absorbed in intestines on oral administration; it is essentially excreted in urine within the first 24 hours after absorption.

Basic clinical pharmacology of thymol: -

It reliefs headache, diarrhea; it is anti cancer, anti septic, anti inflammatory, antioxidant, anti fungal, anti spasmodic, anti bacterial, prevent free radical, cardio vascular disease, it is analgesic, reduces lipids, treat pain & neurological diseases.

- **P-cymene:** -

It is a naturally occurring aromatic organic compound; it is insoluble in water, it has a mild pleasant odour; it floats on water; it is a hydrocarbon mono-terpene; it is present in many essential oils (mainly in cumin & thyme oil).

Main sources of p-cymene: -

Cumin oil, thyme oil, basil oil, carrot seed oil, clove bud oil, angelica root & seed oil, grape fruit oil, eucalyptus oil.

Basic pharmacokinetics of p-cymene (based on human intake in natural food products): -

It is well absorbed through skin; little excreted unchanged & remainder being oxidized to water-soluble metabolism.

Basic clinical pharmacology of p-cymene: -

It is anti inflammatory, reduces pulmonary oedema, it is used for flavouring cakes, beverages, confectionaries, fragrances etc; it is anti bacterial, anti fungal, analgesic, antioxidant, anxiolytic, anticancer, antinociceptive.

- **Pyrazine:** -

It is a heterocyclic aromatic organic compound; it is water soluble; it is used as flavouring agent & fragrance agent; it is present in black seed oil, fenugreek seed oil. It is anti tumour, anti biotic, diuretic.

It is excreted as glucuronates or bound to glutathione via kidneys after hydroxylation. Its absorption is not known.

- **Anethole:** -

It is an organic compound widely used as a flavouring substance; it is also called as anise camphor; it has a different odour; it is slightly soluble in water, it is terpene in nature, it has flavour similar to licorice; it is present in anise oil, fennel oil, star anise oil, damiana. It is absorbed in intestines by passive diffusion transport. It is anti tumour, anti fungal, heals wounds, cuts, bruises, it is muscle relaxant, expectorant, increases breast milk, digestion; it controls weight; it clears mucus.

- **Benzenediol:** -

It is an aromatic organic compound; it is type of phenol; it is also called as hydroquinone; it is used in cosmetic & medicated ointment to make skin bright & lighter; it decreases the production of melanin pigments in skin; it reduces dark spot & pigmentations on skin; it is absorbed through skin & intestine; it crosses BBB. It is banned in USA because it was found to have carcinogenic effects when used in artificial forms in creams etc.

- **Cuminaldehyde:** -

It is a constituent of essential oil of eucalyptus, myrrh, cassia, cumin etc; it has a pleasant smell & contributes to the aroma, of these oil; it is used commercially in perfumes & cosmetics; it is a small molecule thus inhibits the fibrillation of alpha-synuclein (which if aggregate, forms insoluble fibrils in disease like parkinson's, dementia with Lewy bodies & multiple systemic atrophy).

- **Caryophyllene**:-

It is a natural bicyclic sesquiterpene present in many essential oils like clove oil (syzygium aromaticum stem & flower oil), cannabis sativa oil, rosemary oil, hops oil, basil oil, lavender oil, cinnamon oil, black caraway. It is anti inflammatory, analgesic, prevents arthrosclerosis, osteoporosis, colitis, osteoarthritis, diabetes, cerebral ischemia, anxiety, depression, liver fibrosis, anti cancer. Its absorption & metabolism is not known.

- **Linolenic acid (ALA)**:-

It is an omega 3 fatty acid, it is an essential fatty acid necessary for health & cannot be produced in human body, it is also called as ALA (alpha linolenic acid). It is the substrate for the synthesis of longer-chain, more unsaturated fatty acids eicosapentaenoic acid (EPA) & docosahexaenoic acid (DHA) required for tissue function.

Main sources of linolenic acid (ALA):-

Flax seed oil, rape seed oil, soybean, pea leaves, fish oil, evening primrose oil, vegetable oil, walnut, meat, grape seed oil.

Basic pharmacokinetic of ALA (based on human intake in natural food products):-

Same as omega 6

Basic clinical pharmacology of ALA:-

It is useful to prevent heart disease, control blood pressure, control cholesterol, prevents & reverse atherosclerosis, it is anti inflammatory, anti obesity, anti cancer, reduces fibroadenoma, breast lumps, good & helpful for skin, nail, hair, brain, organs.

- **Lutein & zeaxanthin**:-

Both are important carotenoid found in nature, they are related with beta carotene & vitamin A, they give plants, fruits & vegetables yellow or red colour, they are absorbed best in human when taken with high-fat meal because it needs bile for digestion. Both are colour pigment found in human eye (macula & retina) they get deposited in macula & retina thus prevents many diseases of eyes.

Main sources of both:-

They are present in carrot, broccoli, kale, spinach, grapes, pumpkin, yellow vegetable, egg yolk, green leafy vegetable, orange, kiwi, corn etc.

Basic pharmacokinetics of both (based on human intake in natural food products):-

They are absorbed with the help of bile by mucosa of small intestine via passive diffusion & send to the liver via lymphatic system & in liver it is incorporated into low density & high density lipoproteins & transported to target tissues (retina etc) by specific lutein binding protein mediates the selective uptake of it. The absorption depends on the amount & sources of intake; it is 70 % absorbed; it is excreted in bile & urine & stored in liver & adipose tissues of the body.

Basic clinical pharmacology of both:-

They are powerful anti oxidant, anti diabetic, anti cancer. They prevent age-related macular degeneration, cataract, retinitis pigmentosa, retinopathy, macular degeneration, they work as light filter & protect the eye tissues from sunlight damages, they block blue light from reaching the underlying structure in the retina of eyes thus reduces the risk of light induced oxidative damage that could lead to age-related macular degeneration (AMD).

They also prevent free radicals thus prevents colon cancer, cervical cancer, lungs cancer, breast cancer, prostate cancer, vision loss, improves mental function, respiratory infections, reduce high blood

pressure, reduce soreness of muscles after exercise, reduce eye strain, controls diabetes, prevent heart diseases etc.

- **Oleic acid:** -

Its short hand notation is C18:1, it is a non essential (means it is produced naturally in the body) monounsaturated omega 9 fatty acid, It is insoluble in water & soluble in alcohol. It increases absorption of many drugs through skin by disrupting the lipids under the skin and penetration of the drugs, so pumpkin seed oil is best to be used with other applications on skin and used in cosmetic formulas.

Main sources of oleic acid: -

It is present in extra virgin olive oil is the best, also present in avocado oil, camellia oil, shea nut oil, apricot oil, sweet almond oil, whole egg, nuts, argan oil, pumpkin seed oil, grape seed oil etc.

Basic pharmacokinetics of oleic acid (based on human intake in natural food products): -

It is believed that it is absorbed by different tissues mediated via passive diffusion to facilitate diffusion (this is under research) after taken up by the tissues it is stored in the form of natural triglycerides or oxidized, it is transported by lymphatic system; it is also believed to penetrate through skin (it is under research), its excretion is in stool. It is stored 98% in adipose tissues depots in form of triglycerides. Its metabolism & plasma half life is yet not known.

Basic clinical pharmacology of oleic acid: -

It increases bioavailability of following medicines cortisol, hydrocortisone, betamethasone, 17 benzoate betamethasone, 17 valerate (betamethasone), ketorolac (anti inflammatory), metronidazole, progesterone & estradiol. So I advised to mixed powder of prednisolone mixed in extra virgin olive oil and apply on eczema & psoriasis and get good results in cheaper rates.

Oleic acid prevents cardio vascular disease, blood pressure, skin disease, breast cancer, colon cancer, prostate cancer, stomach cancer, diabetes, gall stones, gastrointestinal disease and pancreatic disease. It reduces cholesterol, triglycerides, LDL, inflammation, swelling etc.

- **Stearic acid:** -

It is saturated fatty acid.

Main sources of stearic acid: -

It is mainly present in olive oil, also present in butter, whole milk, yeast bread, egg, pumpkin seed oil, grape seed oil etc.

Basic pharmacokinetics of stearic acid (based on human intake in natural food products): -

Its absorption, metabolism & excretion are under research.

Basic clinical pharmacology of stearic acid: -

It cleans the skin & removes dirt, sweat & excessive sebum from skin & hair.

- **Palmitoleic acid:** -

It is an omega 6 monounsaturated fatty acid; it is present in all tissues of human body & also in adipose tissues & in liver in high concentration.

Main sources of palmitoleic acid: -

It is mainly present in pumpkin seed oil, breast milk, vegetable oil, marine oil, macadamia oil, salmon oil, grape seed oil.

Basic pharmacokinetics of palmitoleic acid (based on human intake in natural food products): -

Its absorption, metabolism & excretion are under research.

Basic clinical pharmacology of palmitoleic acid: -

It is anti thrombotic thus helpful in stroke, it is anti inflammatory, reduces cholesterol & other lipids, high blood glucose, prevents cardio vascular disease, obesity and improves insulin sensitivity.

- **Beta carotene:** -

It is an anti oxidant that converts into vitamin A & plays a very important role in human health; it is responsible for the red, yellow, orange colouration in some fruits & vegetables. It promotes eye health & prevents eye diseases.

Main sources of beta carotene: -

It is present in pumpkin, carrot, sweet potato, dark leafy vegetables, apricot, red & yellow pepper, spinach, kale, grapes etc.

Basic pharmacokinetics of beta carotene (based on human intake in natural food products):

It is absorbed in intestine by passive diffusion & get converted into provitamin A in the presence of bile acids, the intestinal mucosa plays a key role in converting it into provitamin A. It is transported in blood plasma exclusively by lipoproteins. The complete absorption, metabolism & excretion is not known fully. It is stored in fats & liver.

Basic clinical pharmacology of beta carotene: -

It is anti oxidant, reduces risk of lung cancer & promote lung health, reduces free radicals thus prevents cancer & heart disease, diabetes, promotes skin health, improves complexion, hair health, eye health, brain health; reduces pimple, acne & other skin problems.

- **Arachidic acid:** -

It is also called as Eicosanoic acid; it is among omega 6 fatty acid; human body uses it as a starting material in synthesis of 2 kinds of essential substances (prostaglandin & leukotrienes both are unsaturated carboxylic acid).

Main sources of arachidic acid: -

It is present in meat, fish, seafood, egg, chicken, peanut oil, corn oil etc.

Basic pharmacokinetics of arachidic acid (based on human intake in natural food products): -

Its absorption, metabolism & excretion are yet not known & are under research.

Basic clinical pharmacology of arachidic acid: -

It is eaten by body builders to gain muscles due to its inflammatory action in the body; it leads to increase production of eicosanoids that help raise immunity, inflammatory response in human body, it also reduces depression, increases lean muscles.

- **Omega 3:** -

It is also called as n-3 fatty acid, it is polyunsaturated fatty acid, it plays important role in human diet & physiology. It is of 3 type alpha linolenic acid, eicosapentaenoic acid (EPA) & docosahexaenoic acid (DHA).

Main sources of omega 3: -

Walnut, flax seed oil, clary seeds, algal oil, almond, hemp oil, fish, egg, fish oil, grape seed oil etc.

Basic pharmacokinetics of omega 3 (based on human intake in natural food products): -

Same as omega 6.

Basic clinical pharmacology of omega 3: -

It reduces risk of cardio vascular disease, cancer, heart disease, inflammation, symptoms of rheumatoid arthritis, promotes brain, nail, hair, skin, bone, joints health, reliefs depression, improves vision, strengthens the body.

- **Omega 6:** -

It is a polyunsaturated fatty acid, it is also called as w-6 fatty acid or n-6 fatty acid; it is an essential fatty acid (our body needs it but cannot prepare it). The imbalance between omega 3 & 6 may lead to many health problems & heart problems.

Main sources of omega 6: -

It is present in egg, nuts, fish oil, whole grains, vegetables oil, flaxseed oil, grape seed oil, evening primrose oil etc.

Basic pharmacokinetic of omega 6 acid (based on human intake in natural food products): -

It is first hydrolyzed from eaten diet (mostly in triglycerides & phospholipids) by pancreatic enzymes, and then bile is secreted from gall bladder into intestines for further digestion (mostly in ileum). Linoleic acid is the parent compound of omega 6 fatty acid, during digestion & metabolism linoleic acid is converted into Gama linoleic acid & then into dihomo-gama-linolenic acid then into arachidonic acid then into adrenic acid. Its excretion is not yet known & is under research.

Basic clinical pharmacology of omega 6: -

It is beneficial in asthma, arthritis, vascular disease, thrombosis, atherosclerosis, cancer, stroke; increase health of skin, nails, hair, bones, eyes etc, also heals the wounds. But if taken too much in diet can cause high blood pressure, heart disease, blood clots etc.

- **Linoleic acid:** -

It is a carboxylic acid, it is polyunsaturated with omega 3 & 6 fatty acids; its short hand notation is 18:2, it is an essential fatty acid that must be consumed for health.

Main sources of linoleic acid: -

It is present in olive oil, evening primrose oil, sunflower oil, walnut oil, hemp oil, grape seed oil, safflower oil, egg yolk, butter, pumpkin seed oil etc.

Basic pharmacokinetics of linoleic acid (based on human intake in natural food products): -

It is first hydrolyzed from dietary fats & pancreatic enzymes & then with the help of bile it is absorbed in small intestine; metabolism & excretion are under research.

It gets converted into gamma linoleic acid (GLA) in the body, GLA is converted in the body into dihomo GLA (20 carbon chain) & it is converted into Arachidonic acid which is converted into Docosatetraenoic (long-chain fatty acid with 22 carbons) acid.

Basic clinical pharmacology of linoleic acid: -

It acts on prostaglandin system of the body thus is anti-inflammatory, blood thinner, vasodilator (expand the blood vessel) it is very helpful in treatment of rheumatoid arthritis, breast lumps, fibro-adenoma (nodes in breast), cancers, reduces cholesterol, it prevents heart disease, diabetes, skin ulcers, irritable bowel syndrome etc.

- **Myristic acid:** -

It is a common non toxic long-chain saturated fatty acid; it is also called as tetradecanoic acid; it is water soluble; its salt & esters are commonly referred as myristates.

Main sources of myristic acid: -

It is mainly present in pumpkin seed oil, butter fat, palm kernel oil, coconut water & oil, nutmeg oil etc.

Basic pharmacokinetics of myristic acid (based on human intake in natural food products): -

Its absorption, metabolism & excretion are under research.

Basic clinical pharmacology of myristic acid: -

It cleans the skin & keeps the skin hydrate, plump & youthful; it is used in beauty products, shaving, soaps, creams, lotions, hair conditioner & personal care products manufacturing.

- **Tannin:** -

It is of astringent (dry & puckery feeling in mouth) taste, it is a polyphenol present in many plants, fruits, plant's wood, bark, leaves, skin, seeds etc. It is also called as Tannic acid; it is of 2 types hydrolysable & condensed. Hydrolysable is decomposable in water & reacts with water & form other substance. Condensed form is insoluble & precipitates, it is called as tanner's reds. But most of tannic acid is water soluble.

Main sources of tannin: -

It is present berries, apple, barley, nut, tea, legumes, grapes, pomegranate, quince, oak wood, lemons, squash etc.

Basic pharmacokinetics of tannin (based on human intake in natural food products): -

Its absorption, metabolism & excretion are yet not known & are under research. After ingestion its bioavailability is poor due to its large size, high affinity to bind to plasma protein & low lipid solubility. It gets hydrolyzed in glucose & release gallic acid & other compounds upon decomposition.

Basic clinical pharmacology of tannin: -

It is used internally & externally. Externally it cures & heals the condition when applied on cold sores, fever blisters, diaper rashes, bleeding gums, tonsillitis, skin rashes, white discharge, yellow discharge, minor burn etc. It is used as douche for vaginal disorders like white or yellow discharge.

In food it is used as flavoring agent & naturally present in fruits etc, it relieves & cures chronic diarrhea, dysentery, hematuria (blood in urine), pain in joints, persist cold, cancers etc, it reduces high blood pressure, high lipids in blood. It is anti aging, anti oxidant, anti bacterial, anti enzymatic. It is used in medicated ointments for piles.

If used excessive it can give toxic effects on skin & internally may reduce absorption of vitamin, cause stomach irritation, nausea, vomiting, liver damage, kidney damage. It should not be used in pregnancy, breast feeding & constipation.

- **Beta-sitosterol:** -

It is among phytosterols & a main dietary phytosterol found in plants. It is anti cancer, anti inflammatory, it improves urine flow, reduces symptoms of heart diseases, reduces cholesterol, boost immune system, reliefs bronchitis, migraine, asthma, fatigue, rheumatoid arthritis, improve hairs quality, reliefs prostate problems, improves erectile dysfunction, psoriasis, libido.

Main sources of beta-sitosterol: -

Canola oil, avocados, almond, soya bean oil, nuts, vegetable oil, dark chocolate, rice bran oil, wheat germ, corn oil, peanuts, grapes etc.

- **Phytosterol:** -

It is plant sterol & stanol esters; it is a group of naturally occurring compound found in plant cell membranes. It is structurally similar to our body's cholesterol & it competes with cholesterol during digestion & blocks absorption of it thus reduces blood cholesterol & is good for heart.

Main sources of phytosterol: -

Vegetable oil, seeds, nuts, grapes, cereals, nuts, legumes etc.

Basic pharmacokinetics of phytosterol (based on human intake in natural food products): -

It is absorbed only in trace amount only; it inhibits the absorption of intestinal cholesterol & biliary cholesterol.

Basic clinical pharmacology of phytosterol: -

It reduces cholesterol, risk of coronary heart disease, cancer cells growth, prevent diseases, maintain prostate gland health, it is anti inflammatory, maintain health of nails, hair etc.

• Carbohydrate: -

It is a macronutrient needed by the body, the body receives 4 calories per 1 gram of it; carbohydrates includes sugar, glycogen, starch, dextrin, fibre & cellulose that contain only oxygen, carbon & hydrogen. It is classified in simple & complex; simple carbs are sugar & complex carbs are fibre & starch which take longer to digest. It is basic source of energy for our body.

Main sources of carbohydrates: -

It is present in watermelon (little), potato, sweet potato, bread, oats, butter, white rice, whole grain rice, pasta, lentils, banana, pineapple, quince, cucumber etc.

Basic pharmacokinetic of carbohydrate (based on human intake in natural food products): -

Its digestion begins in mouth; salivary glands releases saliva & salivary amylase (enzyme) which begins the process of breaking down the polysaccharides (carbohydrates) while chewing the food; now the chewed food bolus is passed in stomach through food pipe (esophagus); gastric juice like HCL, rennin etc & eaten material are churned to form chyme in the stomach; the chyme now is passed little by little down into duodenum, pancreatic amylase are released which break the polysaccharides down into disaccharide (chain of only sugars linked together); now the chyme passes to small intestine, in it enzymes called lactase, sucrase, maltase etc breakdown disaccharides into monosaccharide (single sugar) & absorbed in upper & lower intestines, through villi present in small intestine & send into liver through venous blood present into portal veins, as per bodies need it is released in the blood stream & pancreas release insulin to use it as source of energy for the body, & extra is stored is converted into glycogen by liver & stored in liver & little is stored in muscles & tissues. Liver can reconverts glycogen in to sources of energy if body lacks for other source of energy, the undigested carbohydrates reaches the large intestine (colon) where it is partly broken down & digested by intestinal bacteria, the remains is excreted in stools.

Clinical pharmacology of carbohydrates: -

Carbohydrates are main sources of body energy, it helps brain, kidney, heart, muscles, central nervous system to function, it also regulates blood glucose, it acts on uses of protein as energy, breakdown of fatty acids & prevent ketosis. If we eat less carbohydrate it may lead to hypoglycemia, ketosis, frequent urination, fatigue, dizziness, headache, constipation, bad breath, dehydration etc.

Excessive intake of carbohydrates may lead to vascular disease, atherosclerosis (leads to narrowing of arteries, stroke, diabetes, obesity, fatty liver, blood pressure etc.

• Vitamin C: -

It is also called as Ascorbic acid; it is an essential water soluble vitamin, very much needed by the body for many functions & absorption etc.

Main sources of vitamin C: -

It is present in watermelon, citrus fruit, broccoli, cauliflower, sprouts, capsicums, papaya, strawberries, spinach, green & red chillies, cabbage, leafy vegetables, tomato, cereals, quince, cucumber etc.

Basic pharmacokinetic of vitamin C (based on human intake in natural food products): -

It does not need to undergo digestion, 80 to 90% of it eaten is absorbed by intestine cell border by active transport & passive diffusion & through ion channels it enters the plasma via capillaries. It is very

little stored in adrenal glands, pituitary gland, brain, eyes, ovaries, testes, liver, spleen, heart, kidneys, lungs, pancreas & muscles. All together body can store 5 grams of it & we need 200mg/day in order to maintain its normal level & uses, but old, disease person, smokers & alcoholic need more daily value. It is excreted in urine in the form of dehydroascorbic acid changed by liver & kidneys both, but unused vitamin C is excreted intact.

Basic clinical pharmacology of vitamin C: -

It prevent cough & cold, repairs tissue, acts as an enzyme for curtain neurotransmitter, important for immune function, it is a powerful antioxidant (donates electron to various enzymatic & non-enzymatic reactions); body prepares collagen with the help of vitamin c; it is also helpful in Alzheimer's, dementia, acts on iron absorption, it protects the body from oxidative damages, reduces stiffness of arteries, reduces tendency of platelets to clump each other, improves nitric oxide activity (dilatation of blood vessels) thus prevents high blood pressure & heart disease, also prevent eye disease, reduces risk of cataract, prevents the lining of lungs & prevents lung disease, it is a natural antihistamine (anti allergy), eliminates toxins from the body. Deficiency of it causes Scurvy disease (brown spots on skin occurs, swelling of gums, bleeding from all mucous membrane, spots are more on thighs & legs, the person looks pale, feel depressed, cannot move, loss of teeth, suppurative wounds occur.

- **Vitamin B1 (Thiamin): -**

It is called as Thiamin also; it is a water soluble vitamin, it belongs to B-complex family, it is an essential micro nutrient which cannot be made by our body.

Main sources of vitamin B1: -

It is present in watermelon, spinach, legumes, banana, quince, wheat germ, liver, egg, meat, dairy products, nuts, peas, fruits, vegetables, cereals, rice, breads, oats, cucumber etc.

Basic pharmacokinetic of vitamin B1 (based on human intake in natural food products): -

Intestinal phosphatases hydrolyze thiamin to make it free & absorbed in duodenum, jejunum mainly through active transport in nutritional doses & passive diffusion in pharmacological doses, very little is known about its absorption; it is metabolized in liver; it is excreted in urine & stored little in liver, heart, kidney, brain, muscles.

Clinical pharmacology of vitamin B1: -

It is needed for metabolism of glucose, amino acids (proteins), lipids (fats) etc; every cell of the body require it to form ATP (adenosine triphosphate) as a fuel for energy, also it enables the body to use carbohydrates as sources of energy; also nerve cells, heart cells, muscles cell require it to function normally; its deficiency causes beri-beri heart disease, weight loss, confusion, malaise, optic neuropathy, irritability, memory loss, delirium, muscles weakness, loss of appetite, tingling sensation in arms & legs, blurry vision, nausea, vomiting, reduce refluxes, shortness of breath etc; it is helpful to immune system; excessive intake of carbohydrates, protein, glucose (speacially in body builders, athletes etc) increases the need of vitamin B1.

- **Vitamin B2: -**

It is also called as Riboflavin, it is a water soluble vitamin, it is an essential micro nutrient, it helps many systems of the body; it is not synthesized in human body.

Main sources of vitamin B2: -

It is present in watermelon, liver, milk, dairy products, nuts, egg, fish, leafy vegetables, almonds, mushroom, lean meat and quince, cucumber.

Basic pharmacokinetic of vitamin B2 (based on human intake in natural food products): -

It is phosphorylated in the intestinal mucosa during absorption; mainly absorbed in upper gastrointestinal tract; the body absorbs little from a single dose beyond of 27mg; when excessive amount is eaten it is not absorbed; very little is known about its absorption. The conversion of it into its coenzymes takes place mainly in cells of small intestines, heart, liver, kidneys & throughout the body in many cells; it is excreted in urine & stored little in liver, heart, kidneys & in tissues of the body.

Basic clinical pharmacology of vitamin B2: -

It is needed by the body to keep skin, eyes, nerves, red blood cells healthy, it also helps adrenal gland, nerve cells, heart, brain to function; it also act in metabolism of food, amino acids (protein), fats, helps to convert carbohydrate into energy (Adenosine triphosphate formation- the energy body runs on). It plays an important role in functioning of mitochondria.

Its deficiency is called as Ariboflavinosis & causes weakness, throat swelling, soreness of mouth & tongue, cracks on skin, dermatitis, anemia, weak vision, itching & irritation in eyes, migraine.

• Vitamin B3: -

It is called as Niacin or Nicotinic acid; it is in 2 forms niacin & nicotinamide acid; it is water soluble vitamin; it is an essential micro nutrient; it plays a role in over 200 enzymatic reactions in the body; It is produced in the body in small amount from tryptophan which is found in protein containing food & sufficient amount of magnesium, vitamin B6 & B2 (are needed to produce it).

Main sources of vitamin B3: -

It is present in watermelon, green peas, peanuts, mushroom, avocados, meat, egg, fish, milk, cereal, green vegetables, liver, chicken, coffee, potato, corn, pumpkin, tomato, almonds, spinach, enriched bread, carrots, quince, cucumber etc.

Basic pharmacokinetic of vitamin B3 (based on human intake in natural food products): -

If eaten in natural form it is absorbed in stomach & small intestines by the process of sodium-dependent carrier-mediated diffusion in 5 to 20 minutes; if taken in therapeutic doses get absorbed by passive diffusion in small intestines. Its uptake in brain requires energy, in kidneys & red blood cells requires a carrier. It is metabolized in liver in 2 ways either is conjugated with glycine or niacin is form into nicotinamide; it is stored little in liver unbounded to enzymes. It is excreted in urine.

Basic clinical pharmacology of vitamin B3: -

It regulates lipid level in the body; it acts on carbohydrate to form energy sources for the body, it ease arthritis, boost brain function, every part of body needs it to function properly, it helps convert food into energy by aiding enzymes & cellular metabolism, it acts as an antioxidant. It prevents heart disease. Deficiency of it causes pellagra, high blood cholesterol, memory loss, fatigue, depression, diarrhea, headache, skin problems, lesion in mouth, tiredness etc.

• Vitamin B6: -

It is also called as pyridoxine; it is involved in many aspects of macronutrients metabolism; it is present in many food products naturally.

Main sources of vitamin B6: -

It is present in watermelon, quince, chicken, bread, egg, vegetable, soyabean, whole grain cereals, brown rice, fish, legumes, beef, nuts, beans, liver, citrus fruits, starchy vegetables, potato, cucumber etc.

Basic pharmacokinetic of vitamin B6 (based on human intake in natural food products): -

It is absorbed in small intestines, but before absorption a phosphate group has to be removed making vitamin B 6 in free form & absorbed by passive transport, now reaches liver via portal vein, in liver to get metabolized & flown into the blood stream it is bound with albumin & some are taken up by red blood

cells, once getting in blood it can function & promote health & it is excreted mainly in urine & little is excreted in stools, it is very little stored in tissues, muscle tissues, liver, brain, kidneys, spleen.

Basic clinical pharmacology of vitamin B6: -

It is needed for proper development & function of brain in children; it is needed for neurotransmitter, histamine, haemoglobin synthesis & function. It serves as coenzyme (cofactor) for many reactions in the body, it is the master vitamin for processing amino acids & some hormones, it is needed by the body to prepare serotonin, melatonin & dopamine, it is better to intake it during treatment of tuberculosis. It supports adrenal glands to function; it acts as a coenzyme in the breakdown & utilization of fats, carbohydrates, protein, it is important for immune system, it helps in treatment of nerve compression like carpal tunnel syndrome, premenstrual syndrome, depression, arthritis, high homocysteine level, diabetes, asthma, kidney stones etc.

Its deficiency causes seborrheic dermatitis (eruption on skin), atrophic glossitis with ulceration, conjunctivitis, neuropathy, anaemia etc.

- **Folate (vitamin B9): -**

Folate is an essential micro nutrient, it is a natural form of vitamin B9, it serves many important functions of the body, it plays an important role in cell growth & formation of DNA, RNA & other genetic material & helps in treating many diseases; its name is derived from Latin word *Folium*, which means leaf, leafy vegetables have it in good amount; Folic acid is a synthetic form of vitamin B9.

Main sources of folate: -

It is present in watermelon, quince, dark green leafy vegetables, fruits, nuts, beans, dates, seafood, egg, dairy products, meat, chicken, legumes, beetroot, citrus fruits, broccoli, spinach, cereals, cucumber etc.

Basic pharmacokinetic of folate (based on human intake in natural food products): -

Its absorption is complicated because folate present in food are of many different forms, some of which cannot be absorbed until broken down by intestinal enzymes; it is not absorbed more than 50%; dietary folate contains glutamate that need to separate it from glutamate before absorption starts; It is absorbed in duodenum & jejunum, after absorption it is converted into tetrahydrofolate (the active form of folate), then a methyl group is added to it to form methyltetrahydrofolate; now the body uses it for various functions & metabolism; the body can store folate 20-70mg in liver which is enough for 3 -6 months for the body; it gets excreted in urine & little in stools & bile.

Basic clinical pharmacology of folate: -

It is needed by the body to make DNA, RNA & other genetic material; it prevents many disease & conditions like anaemia, stroke, cardiac diseases, cancers, neurological diseases, macular degeneration (eye disease), palpitation, sores in mouth & tongue, hair fall, graying of hair. It is important in fertilization in male & female, essential during pregnancy to prevent neural tube defect in embryo (it is needed more), it protect us from free radicals & oxidation thus prevent cancers, it is essential in red blood cells formation, reduces high levels of homocysteine.

Its deficiency may cause anaemia, tiredness, palpitation, breathlessness, hairfall, neural tube defect in baby during pregnancy etc.

- **Potassium: -**

It is a mineral with symbol K & atomic number 19, it is an essential mineral which body cannot prepare; it is necessary for heart, kidney & other organs to function, its low level in body is called as hypokalemia & high level is called as hyperkalemia; it is mostly present inside the cells (intracellular); normal blood range is 3.5 to 5.0 milli equivalents per/liter (mEq/L).

Main sources of potassium: -

Potassium is naturally present in banana, orange, dates, raisin, broccoli, milk, chicken, sweet potato, pumpkin, spinach, watermelon, coconut water, white & black beans, potato, dried apricot, beetroot, pomegranate, almond, quince, cucumber etc.

Basic pharmacokinetics of potassium (bases on human intake in natural food products): -

It is absorbed in small intestines by passive diffusion; it is stored mostly inside the cell, little in liver, bones & red blood cells. 80 to 90% potassium is excreted in urine & 5 to 20% is excreted in stools, sweat.

Basic clinical pharmacology of potassium: -

It is a mineral belongs to electrolytes of the body; it conducts electrical impulses throughout the body & assists blood pressure, normal water balance, muscle contraction, nerves impulse, digestion, heart rhythm, maintain pH balance. It is not produced in our body so we need to consume it through eating; Kidneys maintain normal level of it in the body by excreting excessive amount of it in urine or reabsorb it if the amount is less in the body so that the body may reuse it. Its deficiency may cause weakness, low blood pressure, constipation, nausea, vomiting etc.

Its normal amount in body keeps blood pressure normal; water balance in body normal; prevents heart disease, stroke, osteoporosis, kidney stone etc.

- **Sodium: -**

Here we are learning natural sodium, its symbol is Na & atomic no. 11; it is not produced in the body we need to take it in food sources; it is an important & essential mineral on which our body functions; it regulates blood pressure, blood volume etc.

Main sources of sodium: -

Excessive intake of sodium should be avoided; cucumber has very less amount of sodium; vegetables & fruits have less sodium in them which is good for the body. It is present in beans, meat, fish, chicken, chilli, bread, rolls, milk, celery, beetroot etc.

Basic pharmacokinetic of sodium (based on human intake in natural food products): -

It is absorbed in ileum by active sodium transport because it is impermeable & in jejunum absorption takes place via mediated active transport & depends on levels of water, bicarbonate, glucose, amino acids etc; its absorption plays an important role in the absorption of chloride, amino acids, glucose & water; similar mechanism are involved in the reabsorption of it in kidneys when its level in the body falls. It is excreted mainly in urine, little in sweat & stools. It is stores in bones & dissolved in various body fluids.

Basic clinical pharmacology of sodium: -

It is amongst the essential electrolyte within the body, it remains in extracellular fluid (outside the cell) mainly, it carries electrical charges within the body, kidney maintain its normal level in the body, normal level is 135-145 milli-equivalent per liter (mEq/L), it is not produce in the body, it acts on muscles contraction, nerve cells, regulates blood pressure, blood volume; it takes part in every function of the body mostly, its low level in body is called as hyponatremia, it is found more in older aged, kidney disease, heart disease, hospitalized patient, this condition may cause brain edema, low blood pressure, fatigue, tiredness etc; its high level in the body is called as hypernatremia may cause increase in blood pressure, thirst, confusion, muscle twitching or spasm, seizures, weakness, nausea, loss of appetite, swelling in body etc.

- **Calcium: -**

It is natural essential mineral for the body, it is among the electrolytes of the body; its symbol is Ca & atomic no. 20.

Main sources of calcium: -

It is present in watermelon, quince, milk, banana, cheese, green leafy vegetables, soya beans, nuts, fish, meat, egg, bread, flour, yogurt, almonds, kale, soybean, spinach, cucumber etc.

Basic pharmacokinetics of calcium (based on human intake in natural food products): -

Calcium is absorbed in duodenum & upper jejunum (when calcium intake is low) by transcellular active transport process, this depends on action of calcitriol & intestinal vitamin D receptors & when calcium intake is high, absorbed by paracellular passive process throughout the length of small intestine by 3 major steps, entry across the brush border, intracellular diffusion via calcium-binding protein & extrusion; Vitamin D is necessary for absorption of calcium, also vitamin C, E, k, magnesium & exercise increases the absorption of calcium. Also the level of calcium is regulated by calcitonin released by thyroid gland it reduces calcium level in blood when it is excessive & increases the excretion of calcium via kidneys; Parathyroid hormones (PTH) released by parathyroid gland increases the blood level of calcium when body need it or calcium is less in blood & promotes reabsorption of it in kidneys (calcitonin & PTH both have opposite function). Intestines can absorb 500 to 600 mg of calcium at a time; it is mostly stored in bone tissues & teeth & excreted in stool & sweat & little in urine depended upon the level of it in blood. Also estrogen act on transport of blood calcium in bones thus women mostly suffer from osteoporosis after menopause.

Basic clinical pharmacology of calcium: -

Calcium acts on bone health, communication between brain & other parts of the body, muscles contraction, blood clotting; it is a co-factor for many enzymes, it relaxes the smooth muscles & blood vessels; it maintains heart rhythm, muscles function; it is more needed in childhood & deficiency of it in childhood may cause convulsions (seizure); Excessive level of it in blood is called as hypercalcemia & may lead to kidney stone formation, heart attack, stroke, loss of appetite, excessive urination, memory loss etc; its low level in blood is called as hypocalcemia & may lead to cramps in the body, weak bones, weak teeth, numbness, tingling etc.

Contraindication: -

Sarcoidosis, excessive level of calcium in blood, very severe constipation, kidney stones, increased activity of parathyroid gland etc. Hypersensitivity of calcium, severe cardiac diseases, hypercalcemia, hypercalciuria, severe kidney stones etc.

• Iron: -

It is an essential mineral for our body; its symbol is Fe & atomic no. 26; it is an important component of haemoglobin (haemoglobin binds oxygen in lungs & supply it to whole body, it is oxygen carrier).

Main sources of iron: -

It is present in watermelon, quince, meat, dates, spinach, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, chicken, legumes, fish, banana, cabbage, kidney, almonds, cucumber etc.

Meat is the best source of iron, it provides Fe+2 directly which can be transported from intestine to blood stream through Fe+2 transporter ferroportin (this binds with transferring & delivered into tissues).

Basic pharmacokinetics of iron (based on human intake in natural food products): -

The absorption of iron is not known fully; about only 10% of iron taken in food is absorbed; it is absorbed in duodenum & upper jejunum mainly & at the end part of ileum; low pH is needed for its absorption, after absorption it gets bind to transferring (each transferring can carry 2 atoms of iron); ceruloplasmin (protein) also helps in binding of iron; Hepcidin a hormone produced by liver is released when iron stores are full & inhibits iron transport & binding, thus reduces the absorption of iron; vitamin C & copper enhances iron absorption.

Storage of iron: -

Iron is stored in liver (in hepatocytes & kupffer's cells) kupffer's cells play an important role in recycling body iron, they ingest aged RBC liberate iron for it & reuse by breaking down haemoglobin. Little iron is stored in liver, heart, & kidneys in form of ferritin also little in bone marrow, spleen.

Excretion of iron: -

The body does not possess a physiological mechanism for regularly eliminating iron from the body because most of it is recycled by liver cells; iron is lost within cells, from skin & interior surface of the body (intestines, urine, breathe).

Basic clinical pharmacology of iron: -

It is an important component of Haemoglobin (haemoglobin bind oxygen in lungs & supply it to whole body); iron is beneficial for nails, hair, skin etc; it acts on blood production, its deficiency causes Anaemia (low haemoglobin level in blood) (this causes reduced in oxygen carrying capacity & supply of it); most of the iron is present in haemoglobin, it consist of one heme (iron), one protein chain (globin) this allows it to bind & load oxygen from the lungs & supply it to whole body.

Unbound or free iron is highly destructive & dangerous it can trigger free radical activity which can cause cell death & destroy DNA.

- **Copper: -**

It is an essential micronutrient mineral; its symbol is Cu & atomic no. 29; there are lot of health benefits of it; it is needed in little amount in the body.

Main sources of copper: -

It is present in watermelon, quince, spirulina (water-plant), nuts, seeds, lobster, leafy green vegetables, guava, grapes, green olive, kiwi, mango, pineapple, pomegranate, egg etc.

Basic pharmacokinetics of copper (based on human intake in natural food products): -

It is absorbed 30 to 50%; it is absorbed easily than other minerals, its absorption depends on the copper present in the body, when the intake of it is less, absorption is increased & when intake is more absorption is less, it is mainly absorbed in small intestines & little in stomach via carrier-mediated process; its absorption is influenced by amino acids, vitamin C & other dietary factors. After absorption it is bound primarily to albumin, peptide & amino acids & transported to liver. Copper is secreted into plasma as a complex with ceruloplasmin. It is mainly stored in liver little in brain, heart & kidneys; it is excreted mainly in bile & little in urine.

Basic clinical pharmacology of copper: -

Together with iron it enables the body to form RBC; it helps to maintain health of bones, blood vessels, nerves & immune system; it also acts on iron absorption, protein metabolism, growth of body, it acts also on development of brain, heart & other organ; it is needed by the body for making ATP, collagen. Excessive of it may cause Wilson's disease.

Deficiency of copper: -

It is very rare; but may cause cardiovascular disease, genetic defects, inflammation of optic nerve etc.

- **Magnesium: -**

It is an important essential mineral; its symbol is Mg & atomic no. 12; it is a co-factor for more than 300 enzymes that regulates functions in the body. Its normal range in blood is 0.75 to 0.95 millimoles (mmol)/L.

Main sources of magnesium: -

It is present in watermelon, quince, spinach, meat, egg, nuts, dark leafy green vegetables, broccoli, pumpkin seeds, dates, chicken, fish, legumes, cucumber etc.

Basic pharmacokinetics of magnesium (based on human intake in natural food products): -

It is absorbed about 20 to 50% only; it is absorbed about 40% in distal intestine when the level of it is low via passive paracellular transport & about 5% in descending colon when the level of it is high via active transcellular transport. Vitamin D increases its absorption & also acts on its excretion in urine. It is excreted in urine & stool; it is stored in bones.

Basic clinical pharmacology of magnesium: -

It is a co-factor for more than 300 enzymes that regulates functions in the body. It acts on protein synthesis, muscles & nerve function, blood glucose, control blood pressure, it is required for energy production, bone development, synthesis of DNA & RNA. It also plays a role in active transport of calcium & potassium ions, muscles contraction, normal heart rhythm etc.

- **Phosphorus: -**

It is an essential mineral; its symbol is P & atomic no. 15, it is needed for many parts & functions of the body.

Main sources of phosphorus: -

It is present in watermelon, quince, meat, nuts, beans, fish, chicken, dairy products, soy, grains, lentils, cucumber etc.

Basic pharmacokinetics of phosphorus (based on human intake in natural food products): -

It is absorbed 70-85%, it is absorbed 30% in duodenum, 20% in jejunum, 35% in ileum; it is absorbed in inorganic phosphate form by 2 separate process first when the phosphorus intake is high mainly after meals by paracellular sodium independent passive diffusion pathway & second is transcellular sodium dependant carrier-mediated pathway this falls under the control of vitamin D & etc. When calcium level is too high in the body phosphorus is less absorbed, optimum calcium : phosphorus ratio is helpful in its absorption (excess of anyone decreases the absorption of both). It is stored in bones 85% & rest in tissues; it is excreted 80% in urine & rest in stools (excretion of it is a regulatory action of parathyroid hormone (PTH), vitamin D, and fibroblast).

Basic clinical pharmacology of phosphorus: -

It is present in nature combined with oxygen as phosphate. It acts on growth of teeth, bones, repairs of cells & tissues. It plays an important role in metabolism of carbohydrate, fats, protein & ATP. It works with B-complex vitamins & helps kidney function, muscles contraction, normal heart beats, nerve impulse etc.

- **Zinc: -**

It is a trace mineral; symbol is Zn & atomic no. 30; it is necessary for human body as it plays vital role in health.

Main sources of zinc: -

It is present in watermelon, quince, meat, fish, legumes, beans, egg, dairy products, seeds, nuts, whole grains, cucumber etc.

Basic pharmacokinetics of zinc (based on human intake in natural food products): -

It is absorbed 20 to 40%, its absorption depends on its concentration & is absorbed in whole intestines (jejunum has high rate of its absorption) via carrier-mediated mechanism, it is released from food as free ions during digestion. Zinc from animal sources is easily absorbed comparing to plants sources. It is present in bile & pancreatic juices which is released in duodenum & is reused by the body this is called as endogenous zinc & zinc present in food sources is called as exogenous zinc. Its absorption depends on 2 proteins- Albumin & metallophinonein. Albumin enables zinc to be transported from plasma into

enterocytes. It is stored in muscles, bones mainly & little in prostate, liver, kidneys, skin, brain, lungs, heart & pancreas. It is excreted in stools 80% & rest in urine & sweat. Metallophinonein binds to zinc to make it unavailable & excrete it in stools when zinc is excess in the body, & production of metallophinonein is reduced when zinc is less in the body to make zinc available for the body.

Basic clinical pharmacology of zinc: -

It is necessary for immune system, prevents skin diseases, heal skin diseases, helps stimulate activity of at least 100 different enzymes in the body; it is required in little amount in the body, but children, pregnant & old aged need it more. It promotes growth in children, synthesize DNA & acts on wound healing, it is best in treating initial diarrhea & cold cough. It improves learning, memory, fertility etc. It heals acne, attention deficit hyper activity disorder (ADHD), osteoporosis, pneumonia etc.

- **Manganese: -**

It is an essential mineral & micro nutrient, needed by the body for proper health. Its symbol is Mn & atomic no. 25.

Main sources of manganese: -

It is present in watermelon, nuts, beans, legumes, brown rice, leafy green vegetables, pineapple, beetroot etc.

Basic pharmacokinetics of manganese (based on human intake in natural food products): -

It is absorbed 40%, it is absorbed more in women than men; if intake of it is more, than absorption is less & if intake is less, absorption is more; its absorption takes place in small intestines, after absorption it is bounded to blood protein transferring & transmanganin & transport via blood stream to tissues; it is absorbed by inhalation & dermal (skin) also; it crosses brain blood barrier. It is stored in bones, liver, kidney, pancreas; it is excreted mainly in bile & stools, little in urine & sweating; unused manganese is transported to liver for excretion & excreted via bile mainly.

Basic clinical pharmacology of manganese: -

It is needed for proper health of skin, bones, cartilage etc; it helps in glucose tolerance, regulates blood sugar, reduces inflammation, reduces premenstrual cramps, it also aids in formation of connective tissues, bones, sex hormones, blood clotting, metabolism of carbohydrates & fats; it facilitates calcium absorption.

- **Dietary fibre: -**

It is an eatable part of vegetables & fruit; our body cannot digest it just passes the small intestines & colon & excrete in stools; it is of two types 1) soluble fibre 2) insoluble fibre.

Soluble fibre dissolve in water & form a gel like material & helps in controlling blood cholesterol & blood glucose; it is found in apple, carrot, barley, oats, peas, beans watermelon etc.

Insoluble fibre do not dissolve & promotes excretion & increase bulk of the stool thus relief constipation & helps in elimination of toxins also. It is found in wheat flour, beans, cauliflower, potato, green beans, watermelon, beetroot, beet leaves etc.

This is the reason it is helpful in constipation conditions, it can eaten in pregnancy to relief constipation and get other benefits of it also.

Basic pharmacokinetics of dietary fibre (based on human intake in natural food products): -

Soluble fibres get dissolve in water & become a gelatinous substance; do not get digested; it helps to slow the digestion & help the body to absorb vital nutrient from eaten food.

Insoluble fibres do not dissolve in water but remain in fibrous form, and do not get digested; it helps the food pass through the digestive system and increase the bulk of stool & eliminate toxins also.

Basic clinical pharmacology of dietary fibre: -

It helps in slow down the digestive process thus gives a good control in blood glucose, improves insulin sensitivity, reduces risk of diabetes, maintains weight, helpful in obesity, reduces blood pressure, reduces cholesterol, reduces inflammation, reduces risk of heart disease, relieves constipation thus helpful in piles, fistula & other rectal disorders & disease, improves bowel movement thus improves bowel health, slowdowns the digestion thus improves quality of digestion, reduces risk of many types of cancer.

- **Selenium:** -

It is an essential trace mineral, it is micro nutrient helpful to our body; its symbol is Se & atomic no. 34.

Main sources of selenium: -

It is present in watermelon, fish, nuts, beef, chicken, mushroom, egg, grains, garlic etc.

Basic pharmacokinetics of selenium (based on human intake in natural food products): -

It is mainly absorbed in duodenum & proximal jejunum by active transport process; Dietary selenium is in 2 forms organic (selenoimethionine) it is 90% absorbed & inorganic (selenite) it is 50% absorbed; after absorption it is send in liver via portal veins, liver turns it into selenite & then is bound with selenoproteins & send into blood stream, gets in RBC, muscles, tissues etc; it is not distributed evenly in the body, liver has more of it; Vitamin E & other vitamins increases its absorption & both work as an anti-oxidant. Natural selenium remains in the body for less than 24 hours; it is stored in amino acid in skeletal muscles, little in liver, kidneys & pancreas; it is primarily excreted in urine, stool & expired in air via lungs very little in sweat & semen.

Basic clinical pharmacology of selenium: -

It is important for many body functions, immune system, fertility (both male & female); it contributes in thyroid hormone metabolism, DNA synthesis; it protects the body from oxidative damages & infection, it is found in tissues, skeletal muscles; it helps testes & seminal vesicles in their function; it reduces the risk of miscarriages, liver disease, cancer, asthma, cardio vascular disease; deficiency of it causes pain in muscles & joints, weaken the hair, nails, white spots on nails are found etc.

- **Steroid saponins:** -

It is natural glycosidic compounds of amphiphilic character. It is present in fenugreek, yucca, ginseng, asparagus, yams, alliums, legumes, beans, onion, garlic etc.

Basic pharmacokinetics of steroid saponin (based on human intake in natural food products): -

It is poorly absorbed in intestine due to large molecular mass, high hydrogen bonding capacity, unfavourable physicochemical traits, poor membrane permeability, rapid & extensive biliary (stool) excretion many saponins are excreted in urine also.

Basic clinical pharmacology of steroid saponin: -

It reduces cholesterol, LDL, increases testosterone, libido & muscle mass; it maintain balance between cellular proliferation & cell death the disturbances in the balance cause severe diseases like cancer etc; it is anti bacterial, anti oxidant, inhibit tumour growth.

- **Amino acids in black caraway seeds, its oil:** -

- **Absorption & digestion of amino acid.**

When we eat high-protein foods, body breaks down protein into amino acids and peptides through digestive enzymes, such as pepsin & pancreas produces trypsin, chymotrypsin and other that aid in protein digestion.

Pepsin is the primary enzyme responsible for digesting protein; it acts on the protein molecules & breaks the bonds – called peptide bonds – that hold the protein molecules together. Next, these smaller chains of amino acids move in the stomach & then in small intestine where they're further broken down by enzymes released by the pancreas. Small intestine contains finger-like extensions called micro-villi. These structures enhance its ability to absorb dietary nutrients. Now the semi digested material pass through brush border and baso-lateral membranes of small intestine & di-tripeptides are absorbed by passive transport (facilitated or simple diffusion) or active transport (Na^+ or H^+ co-transporters) pathways. Di and tripeptides are more efficiently absorbed than free amino acids which in turns are better absorbed than oligopeptides. They're released into the bloodstream and used for various biochemical reactions.

Each amino acid has a different role in the human body. Upon absorption, some amino acids are incorporated into a new protein. Some fuel your muscles and support tissue repair. Others are used as a source of energy.

Tryptophan and tyrosine, for example, promote brain health. These amino acids support the production of neurotransmitters, leading to increased alertness and optimum nerve responses. Tryptophan also assists with serotonin production, lifting your mood and keeping depression at bay.

Phenylalanine serves as a precursor to melatonin, epinephrine, dopamine and other chemicals that regulate your mood and bodily functions. Methionine helps your body absorb selenium and zinc, two minerals that promote overall health. Some amino acids, such as isoleucine, play a vital role in hemoglobin production and glucose metabolism.

- **Tryptophan:** -

It is an amino acids (protein) that is useful in bio-synthesis of protein; it is essential in human because body cannot make it); it is a precursor of neuro-transmitter serotonin, melatonin, vitamin B3; it is a sedative also.

Main sources of tryptophan: -

Salmon oil, egg, spinach, milk, seeds, fenugreek seed, soy products, nuts, fish, meat, wheat, banana etc.

Basic pharmacokinetics of tryptophan (based on human intake in natural food products): -

It is absorbed in small intestine & reached the blood circulation, it passes the blood brain barrier & in brain cells it is metabolized into indolamine neuro-transmitter, niacin, a common example of indolamine is serotonin derivative from tryptophan. Tryptophan is converted into serotonin in the brain & body; it is believed that tryptophan supplements should be taken with carbidopa, which blocks the blood brain barrier. (Serotonin (5HTP) 5 hydroxytryptamine, is a monoamine neuro-transmitter. It contributes in feelings of well-being, happiness, reward, learning, memory, many physiological functions).

In the pathway of tryptophan/serotonin, melatonin hormone is produced. Melatonin regulates sleep-wake cycle. It is primarily released by pineal gland in brain. It controls circadian (daily clock) rhythms.

Pineal gland releases it at night more & very little in day light. It improves immune system function.

Natural sources of melatonin are tomato, pomegranate, olive, grapes, broccoli, cucumber, barley, seeds, nuts etc.

Fructose malabsorption causes improper absorption of tryptophan in intestine thus leading to low level of it & may cause depression.

Basic clinical pharmacology of tryptophan: -

It is necessary for normal growth of infants; nitrogen balance in adults, it aids in sleep pattern, mood. It is necessary for melatonin & serotonin formation in body, it enhances mental & emotional well being, manages pain tolerance, weight etc. it also helps in build muscle tissue, essential for vitamin B3

production, relives insomnia, reduces anxiety, depression, migraine, OCD, helps immune system, reduces cardiac spasms, improves sleep patter etc.

- **Threonine:** -

It is an amino acid used in biosynthesis of proteins; it is an essential amino acid important for tooth enamel, collagen, elastin, nervous system, fats metabolism, it prevents fats buildup in liver, useful in intestinal disorders, anxiety, and depression.

Main sources of threonine: -

Cheese, chicken, fish, meat, lentil, black seed, nuts, soy etc.

Basic clinical pharmacology of threonine: -

It is useful in nervous system disorders, multiple sclerosis, spinal spasticity, makes bones, joints, tendons, ligament stronger, it helps the immune system, promotes heart health.

- **Isoleucine:** -

It is an amino acid that is used in the biosynthesis of proteins, it is an essential amino acid means the body cannot make it & we depend on food sources, it plays & helps many functions of the body.

Main sources of isoleucine: -

Meat, mutton, fish, cheese, egg, seeds, nuts, soybeans, milk, legumes, fenugreek seed etc.

Basic pharmacokinetics of isoleucine (based on human intake in natural food products): -

It is absorbed in small intestine by sodium-dependant active transport. It is metabolized in liver.

Basic clinical pharmacology of isoleucine: -

It promotes glucose consumption 7 uptake, it is anti-catabolic, enhances athletic performance & best for pre-workout, it acts on wound healing, detox of nitrogenous waste in the body, stimulates immune system, promotes secretion of many hormones, helps in heamoglobin formation, regulating blood glucose, energy in the body, built muscles, helpful to brain for its function.

- **Leucine:** -

It is branched chain amino acid (BCAA) it is ketogenic amino acid; it is necessary when we do exercise, it stimulates protein synthesis & assists in muscle building.

Main sources of leucine: -

Cheese, soyabean, meat, nuts, chicken, seeds, fish, seafood, beans.

Basic clinical pharmacology of leucine: -

It helps regulate blood glucose, promotes growth, recovers the muscles & bone tissues, acts on production of growth hormones, repairs the tissues, essential for muscle building, it burns fats, controls obesity, promotes lean muscles growth.

- **Lysine:** -

It is an essential amino acid, which our body cannot prepare and we need to eat it from food sources. It necessary for many body functions, acts in building blocks of protein (muscles).

Main sources of lysine: -

Red meat, chicken, egg, fish, beans, lentils, wheat germ, nuts, soybeans, spirulina, fenugreek seed, shrimp, pumpkin seed, tuna, cheese, milk etc.

Basic pharmacokinetics of lysine (based on human intake in natural food products): -

It is absorbed from the lumen of the small intestine into the enterocytes by active transport, it undergo first pass metabolism in liver & is metabolized in liver.

Basic clinical pharmacology of lysine: -

It helps the body in tissue growth, repair muscles injury, promote collagen formation, help the body to produce enzymes, antibodies, hormones, supports immune system, its deficiency causes fatigue, irritability, nausea, hair loss, anorexia, inhibited growth, anemia, problems with reproductive system, it is very helpful in treating cold sores (herpes), control blood pressure, diabetes, osteoporosis, helps athletes performance, helpful in treating cancers, reduces anxiety, increase absorption of calcium, improves digestion & prevent leaky gut, helpful in pancreatitis.

- **Methionine: -**

It is a sulfur containing amino acid; it is essential; it plays a critical role in the metabolism & health; it acts on normal cell functioning, growth & repair. It is also a chelating agent for heavy metals; due to its sulfur content it is helpful in hair, nail health & growth & good for skin health; it reduces cholesterol by increasing the production of lecithin in liver & reduces fat formation in liver, also protects kidneys, liver from hepatotoxins, it is an antioxidant. It is absorbed in lumen of small intestines into enterocytes by active transport & metabolized in liver.

Main sources of methionine: -

Meat, mutton, fish, chicken, cheese, egg, beans, milk, nuts, shellfish etc.

- **Cystine: -**

It is the oxidized dimer form of amino acid, it is nonessential; the body uses it to produce taurine & other amino acids; it is a sulfur containing amino acid; our body uses vitamin B6 with the help of cystine; it heals burns, wounds, bronchitis, assist in supply of insulin, it increases level of glutathione in liver, lungs, kidneys & bone marrow. It is anti aging, anti inflammatory, anti arthritis, anti rheumatoid arthritis.

Main sources of cystine: -

Meat, egg, milk, garlic, onion, broccoli, oats, wheat germ, lentils etc.

- **Phenylalanine: -**

It is an aromatic essential amino acid in human; it plays a key role in biosynthesis of other amino acids; it is important in the structure & function of many proteins & enzymes. It is precursor of melanin, dopamine, noradrenalin hormone, thyroxin hormone. It is converted to tyrosine & used in biosynthesis of dopamine & noradrenalin. It improves memory, reduces pain of hunger; it is anti depressant; it is also a building block protein; it is useful in vitiligo, depression, ADHA, parkinson's, multiple sclerosis, pain, osteoarthritis, rheumatoid arthritis, fat burn & helpful in alcohol withdrawal symptoms.

Main sources of phenylalanine: -

Pumpkin seed, nuts, seeds, soy, meat, fish, chicken, egg, beans, milk etc.

- **Tyrosine: -**

It is a nonessential amino acid; it is also called as 4-hydroxyphenylalanine; it is useful in cell synthesis of protein; it is a building block protein; body prepares it from phenylalanine. It is a precursor & used to produce noradrenalin, dopamine, & thyroxin & melanin hormones. It reduces stress, improves memory, it promotes growth, mental health, skin health, fat burn. It acts as a mood elevator, anti depressant, improves memory, mental alertness, its deficiency can cause hypothyroidism leading to low blood pressure, low body temperature (hypothermia), stress, fatigue, narcolepsy; it helps thyroid gland, adrenal gland, pituitary gland to function properly. It is absorbed in small intestine by sodium-dependant active transport; after absorption it reaches the blood & crosses the blood brain barrier (BBB) & enters

the brain cells & gets metabolized into catecholamine (noradrenalin). Human body regulates its amount by eating it by food sources & making inside the body (nonessential). The body does not store it much for later uses.

Main sources of tyrosine: -

Meat, fish, egg, milk, nuts, beans, oats, wheat, black seeds etc.

Dopamine: -

It regulates reward & pleasure centers in brain; it is a chemical important for memory, motor skills & etc.

Nor-adrenaline & adrenaline: -

These hormones are responsible for fight & flight response in stressful situations & also controls many functions of the body; it is secreted by adrenal glands.

Thyroxin: -

It is secreted by thyroid gland; it regulates metabolism, blood pressure, digestion, energy etc.

Melanin: -

It is pigmented hormone, gives our skin, hair, eyes their colour; dark skinned people have more melanin in their skin than light-skinned people (depend on exposure to sunlight).

• **Valine:** -

It is an essential nutrient for vertebrates, biosynthesis of protein; it is an aliphatic & extremely hydrophobic essential amino acid; it is branched chain of amino acid (BCAA); it is important for growth, repair, blood glucose regulation, for energy; it stimulates CNS, proper mental function.

Main sources of valine: -

Cheese, soy, beans, nuts, fish, meat, chicken, mushroom, seeds, nuts, whole grains etc.

• **Histidine:** -

It is an amino acid used in biosynthesis of protein; it is semi-essential amino acid, needed by humans for production of histamine & also for growth & tissue repair, it is helpful in maintaining myelin sheaths that covers the nerves & protects the nerves.

Main sources of histidine: -

Meat, mutton, fish, milk, egg, seeds, nuts, chicken, cheese, soy, beans, whole grains, fenugreek seeds.

Basic pharmacokinetics of histidine (based on human intake in natural food products): -

It is absorbed in small intestine via active transport requiring the presence of sodium.

Basic clinical pharmacology of histidine: -

It plays many roles in immunity, gastric secretion & sexual functions. It is also required for blood cell formation & protects tissues against damage of radiation & heavy metals. It keeps normal pH of 7 in the body, useful in rheumatoid arthritis, allergy, ulcer & anemia caused by kidney failure or dialysis. It is an antioxidant, anti-inflammatory, reduces cholesterol.

• **Arginine:** -

It is among conditional essential amino acids the body needs to function properly; it is made in liver; it plays an important role in building protein thus helpful in body building.

Main sources of arginine: -

Chicken, pumpkin seeds, spirulina, dairy products, red meat, fish, egg etc.

Basic pharmacokinetics of arginine (based on human intake in natural food products): -

It is absorbed in jejunum mainly from oral diet.

Basic clinical pharmacology of arginine: -

It releases nitric oxide in the blood & nitric oxide dilates the blood vessels thus increases the blood supply & controls high blood pressure, it improves erection, builds muscles etc. It also acts on release of growth hormone, insulin & other substances in the body. It also improves heart health, athletes performance, stimulates immune system; citrulline present in watermelon is converted into arginine in kidneys, please refer lesson on watermelon.

- **Alanine:** -

It is a non essential amino acid that is present in blood plasma in its free state in high levels; it is involved in sugar & acid metabolism, protein synthesis, it increases immunity, provides energy for muscles tissues, brain & CNS, it acts on tryptophan, vitamin B6 metabolism; it is an important source of energy for muscles; it helps the body to convert simple sugar (glucose) into energy; it is produced in the body. It increases exercise capacity; reduces muscle fatigue, boost immunity, it is antioxidant; anti aging; increases muscle growth; ideal pre & post workout, reduce blood sugar, prevent liver disease, helps the liver to eliminate toxins, improves CNS functioning, helpful in benign prostate hypertrophy. It is digested in small intestine; it is converted into pyruvic acid by alanine aminotransferase-1; during fasting condition alanine derived from protein breakdown is converted into pyruvate & used to synthesize glucose by gluconeogenesis in liver, it is excreted in urine via urea cycle. It is stored little in skeletal muscles.

Main sources of alanine: -

Meat, fish, egg, milk, aloe vera, honey, black seeds, nuts etc.

- **Aspartic acid:** -

It is a non essential amino acid; it is overall negatively charged & plays an important role in synthesis of other amino acid, citric acid & urea cycles; it is found in animals, plants, sugarcane, sugarbeet. It may be a neurotransmitter; it strengthens the muscles, improves heart function, helps in maintaining mental health, reduces tiredness, improves athletic performance, increases muscle size, reduces depression & fatigue. It is absorbed in small intestine by active transport.

Main sources of aspartic acid: -

Meat, oysters, seeds, oats, avocado, sugar beet, milk, egg, nuts, cereals etc.

- **Glutamic acid:** -

It is a nonessential amino acid. It is an excitatory neuro-transmitter; it is necessary for biosynthesis of proteins; body uses it for several key functions within the body like making other neuro-transmitters such as GABA; it promotes brain health, muscles health, intelligence, mood & mental alertness. It is called as chemical messenger. It plays an important role in body's disposal of excessive waste like nitrogen. It is absorbed in lumen of small intestine into enterocytes by active transport & excreted in urine mainly. It is almost about 2 kilo grams, storage in natural form in brain, kidneys, liver, muscles etc.

Main sources of glutamic acid: -

Meat, chicken, fish, egg, milk, wheat, mushroom, soy, broccoli, walnut, peas etc.

- **Glycine:** -

It is a nonessential amino acid that body needs for growth & maintenance of tissue & need to prepare hormones & enzymes. It is inhibitory neurotransmitter. It helps in preparing glutathione (a powerful antioxidant & reduces free radicals, delay aging). It is helpful in preparing of creatine (provides energy to muscles to perform exercise etc & acts on muscle contraction), beneficial for brain health, bone health, alzheimer's, schizophrenia, sleep disorder, stroke, burns, protects kidney & liver from harmful side

effects of drugs used after organ transplant, heals wound & ulcers, it is anti inflammatory, improves skin health.

Main sources of glycine: -

Meat, fish, milk, legumes etc.

• **Proline: -**

It is a protein-genic amino acid used in biosynthesis of proteins. It heals cartilages, cushion joints, tendons, ligament, heart muscles, connective tissues & helps in formation of collagen.

Main sources of proline: -

Soy, pumpkin seed, lentils, black beans, quinoa etc.

• **Serine:-**

It is a nonessential amino acid, important for synthesis of protein, fats metabolism, muscle growth, immune system; it is a precursor of many amino acids, helpful in enzyme catalyze its reaction, overall health, physical & mental health.

Main sources of serine: -

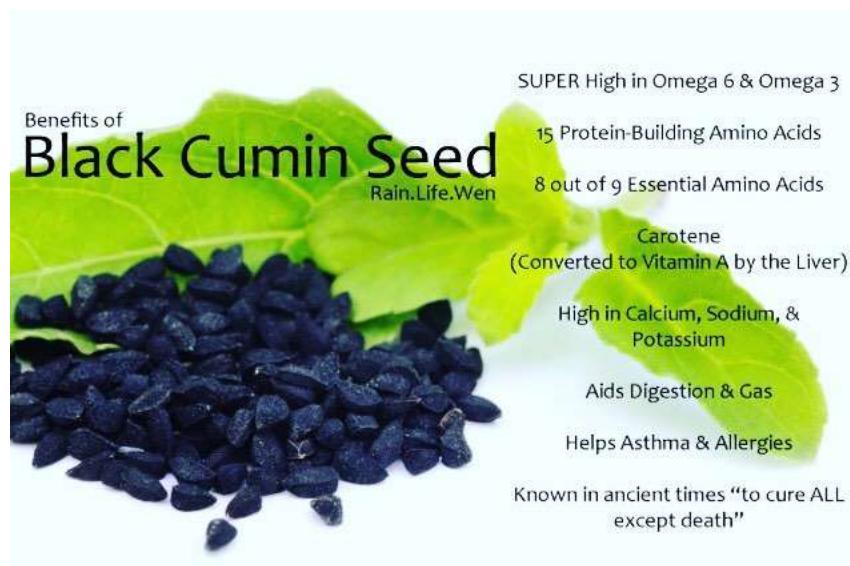
Soybean, egg, lentils, meat, fish, nuts, almonds, walnut etc.

• **Asparagine: -**

It is a non essential amino acid; it acts on biosynthesis of proteins; it is a nontoxic carrier of residual ammonia to be eliminated from the body; it acts as diuretic also; it helps cell, nerve, brain to function. It is helpful to nervous system, reduces fatigue, helps in building muscles, improves liver function, protects liver, beneficial for nerve cells & brain; increases stamina, help in synthesis of various enzymes, proteins, glycoprotein etc.

• **Main sources of asparagine: -**

Milk, meat, egg, fish, soy, potato, legumes, nuts, seeds etc.



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- **Research:** -

SCIENCE & HADEES REGARDING BLACK CARAWAY (KALONJI):

In Hadees it is mentioned that Black Caraway (Kalonji) has healing in it for all diseases except death, research reveals it true & it has been found that it helps & cure in many diseases, here are some with how to use.

Conclusion of research:-

It has many constituents which has preventive, curative properties.

Nigella sativa seeds contain protein (26.7%), fat (28.5%), carbohydrates (24.9%), crude fibre (8.4%), and total ash (4.8%). *Nigella sativa* seeds also contain a good amount of various vitamins and minerals like Cu, P, Zn, and Fe. Many active compounds have been identified in *N. sativa*. The most important active compounds of *N. sativa* are thymoquinone. Some effects of *N. sativa*, such as its hypoglycemic, hypolipidemic and bronchodilatory effects, have been sufficiently studied and are sufficiently understood to allow for the next phase of clinical trials or drug developments. However, most of its other effects and applications require further clinical and animal studies.